

ABSTRACT OF THE DISCLOSURE

A computer controlled method for detecting and diagnosing a rare cell type in a tissue sample is provided, said method comprising treating the tissue sample such that it
5 generates a first signal indicative of the presence at a location of a rare cell, detecting the first signal, treating the location at which the first signal is detected to generate a second signal indicative of a diagnostically useful cellular characteristic and detecting the second signal. The first signal can be morphological or a color present in a sought cell either before or after staining. The second signal can be generated by *in situ* PCR or PCR *in situ*
10 hybridization. In one preferred embodiment, the rare cell type is a fetal cell in a maternal blood tissue sample, said sample consisting of a smear of unenriched maternal blood. In another embodiment, the method is used to diagnose or genotype cancer cells in a blood or tissue biopsy sample.

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